FIG. 1

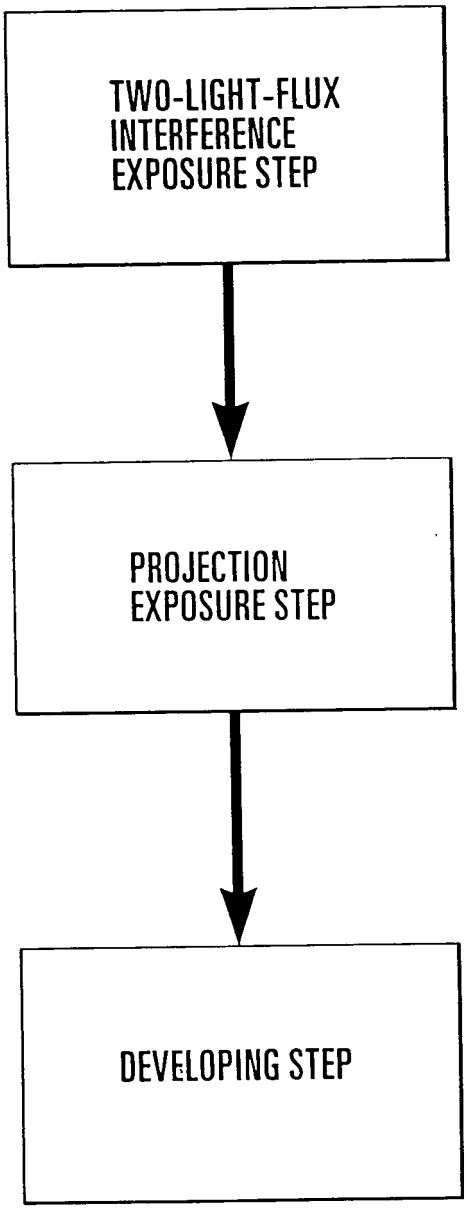

TWO-LIGHT-FLUX INTERFERENCE EXPOSURE STEP
PROJECTION EXPOSURE STEP
DEVELOPING STEP

FIG. 2(A)

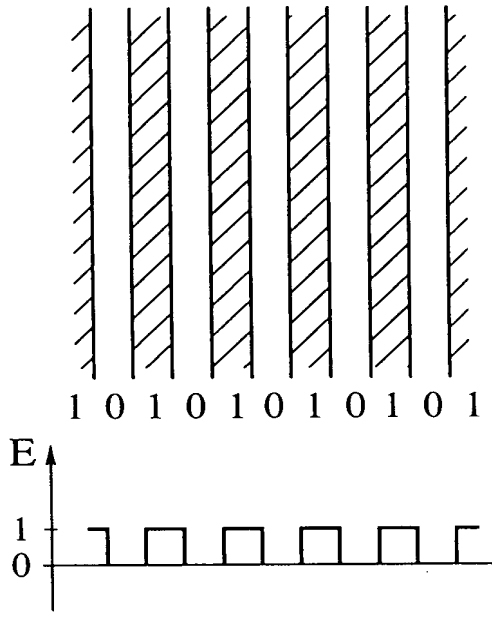


FIG. 2(B)

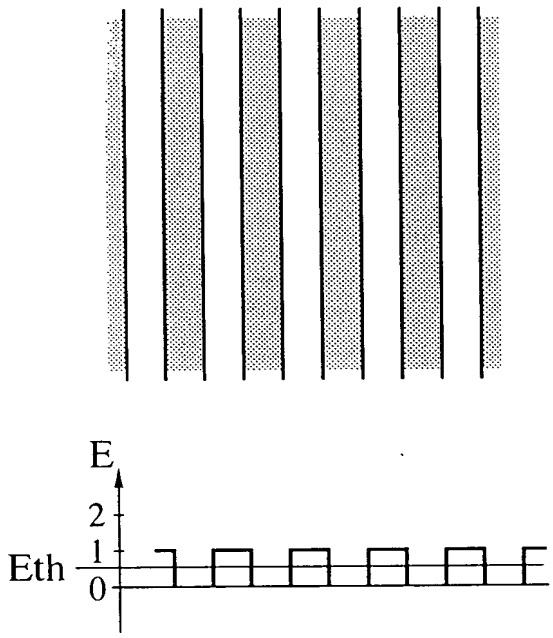


FIG. 3(A)

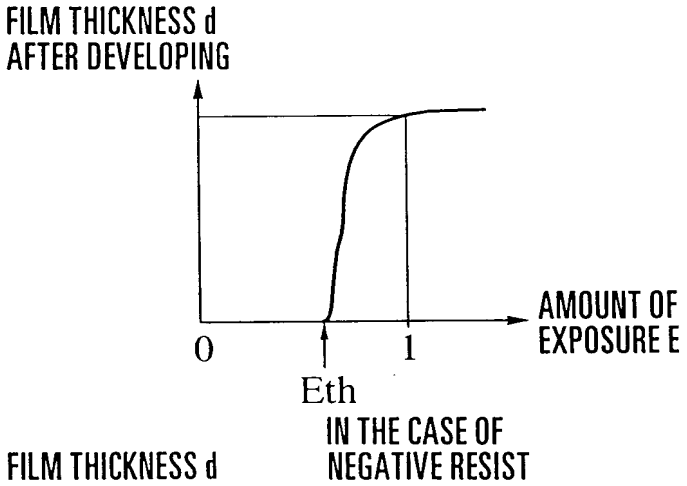


FIG. 3(B)

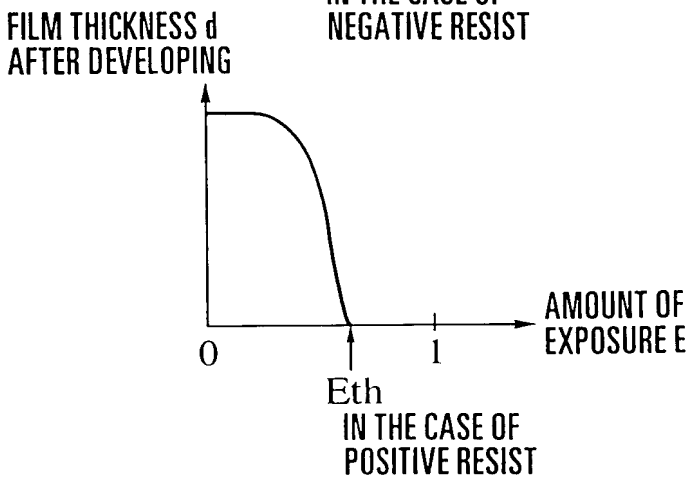


FIG. 4

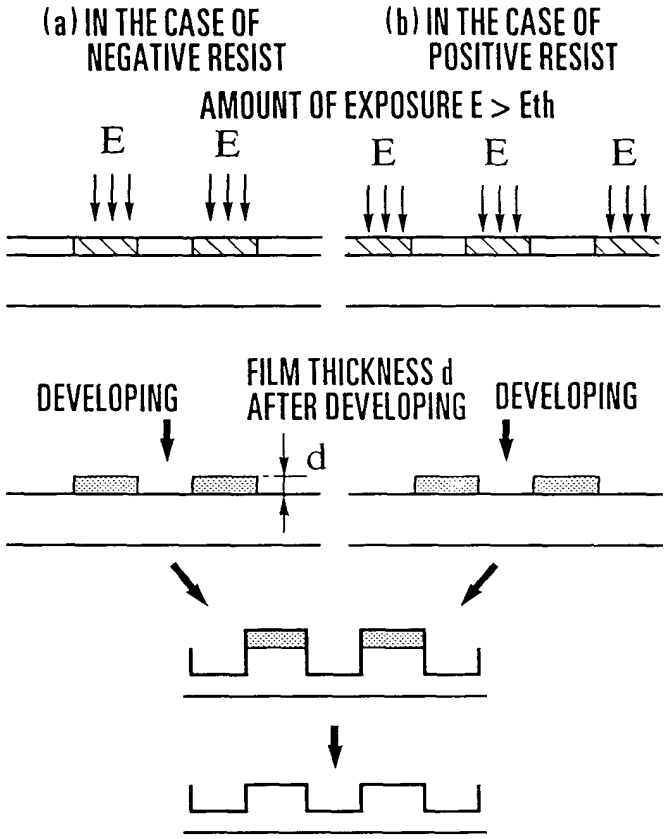

(a) IN THE CASE OF NEGATIVE RESIST
(b) IN THE CASE OF POSITIVE RESIST
AMOUNT OF EXPOSURE E > Eth
E
E
E
E
E
DEVELOPING
FILM THICKNESS d AFTER DEVELOPING
DEVELOPING
d

FIG. 5

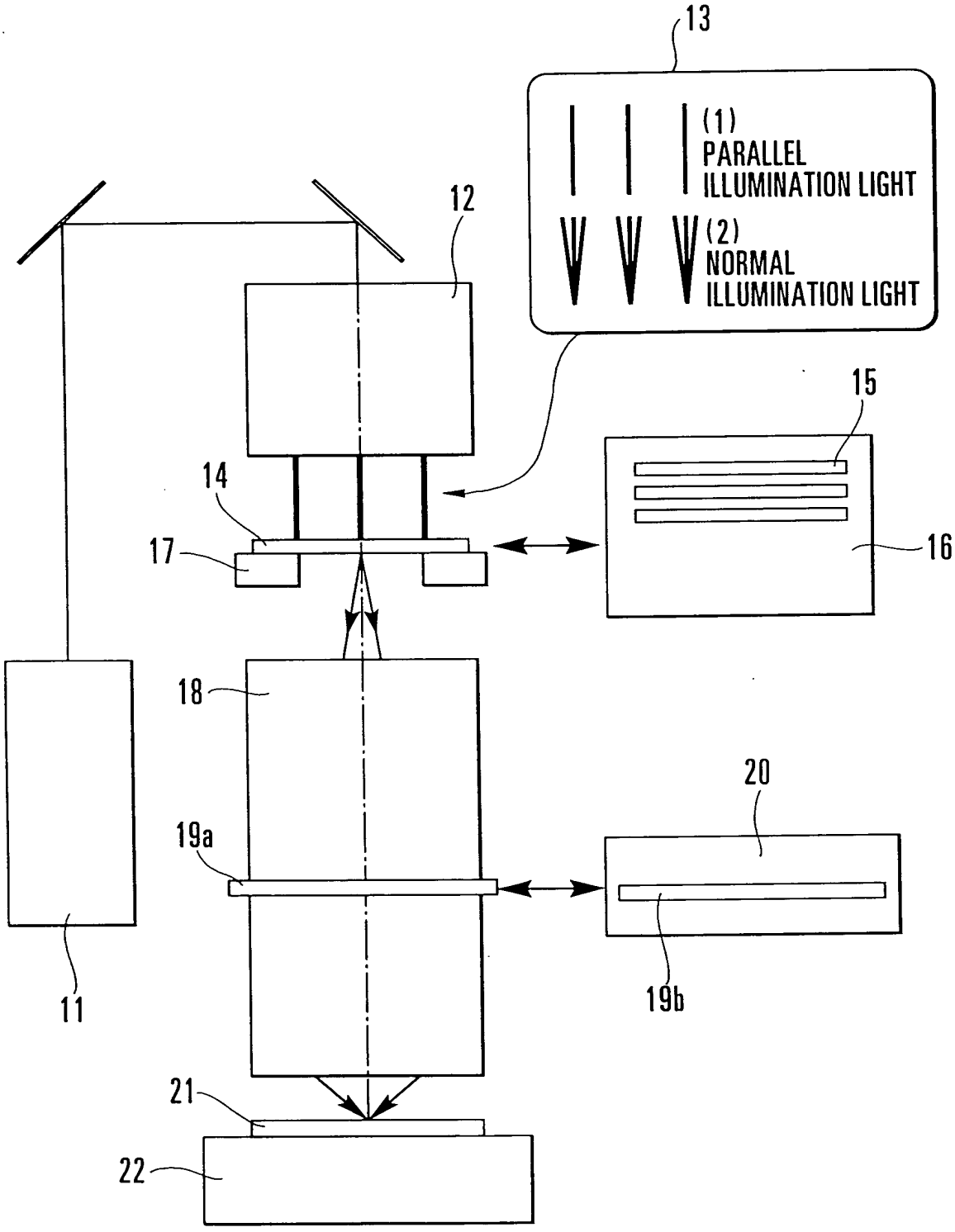

13
(1)
PARALLEL
ILLUMINATION LIGHT
(2)
NORMAL
ILLUMINATION LIGHT
12
15
14
17
16
18
20
19a
11
19b
21
22

FIG. 6

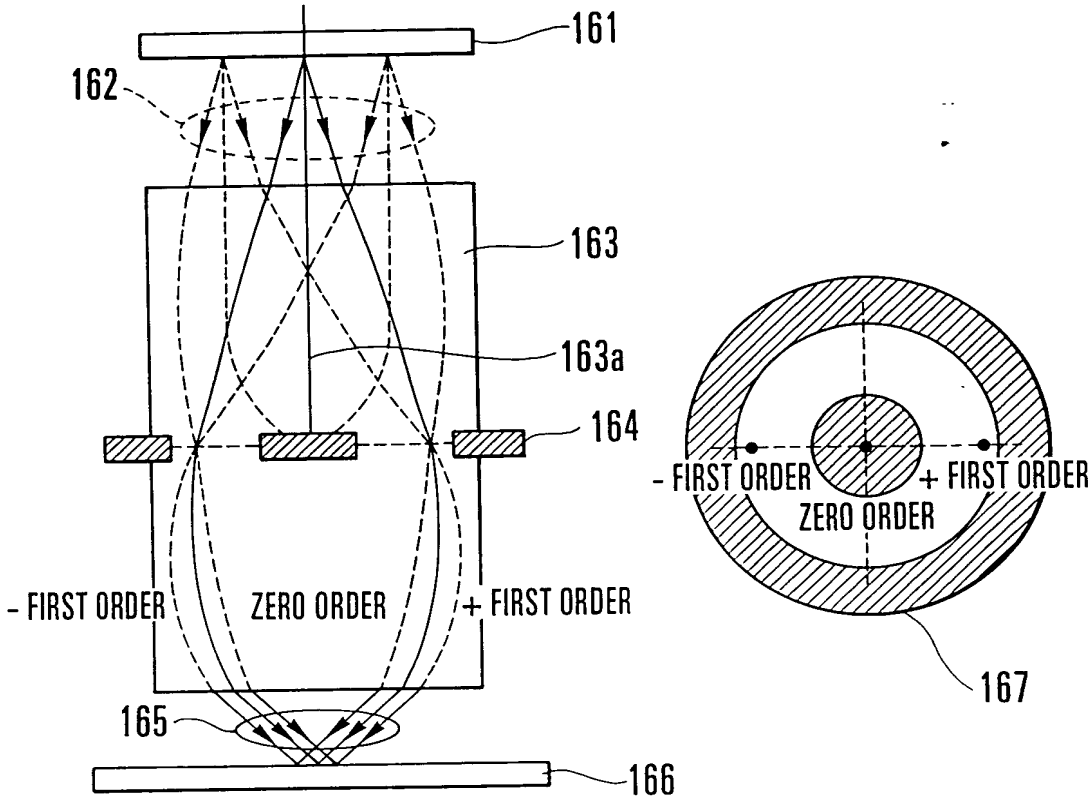

161
162
163
163a
164
- FIRST ORDER
ZERO ORDER
+ FIRST ORDER
165
166
- FIRST ORDER
+ FIRST ORDER
ZERO ORDER
167

FIG. 7

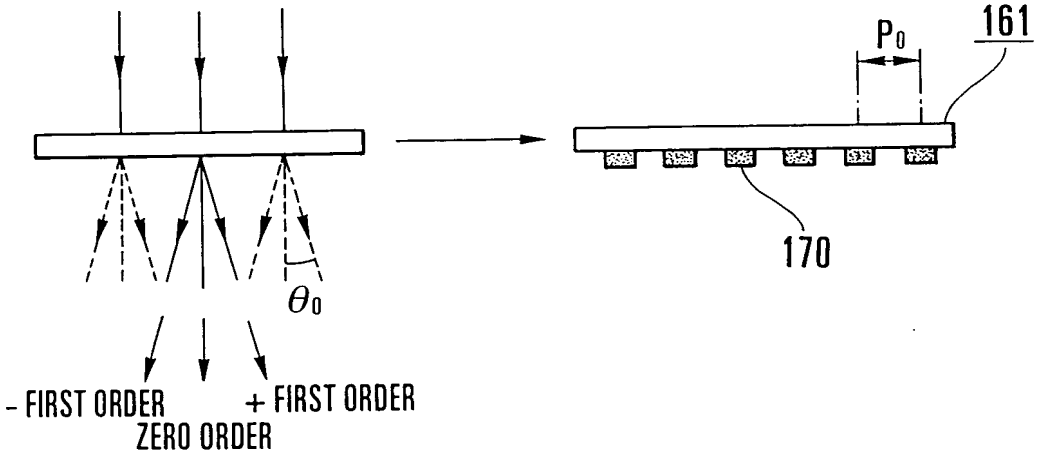

P_0
161
170
θ_0
- FIRST ORDER
+ FIRST ORDER
ZERO ORDER

FIG. 8

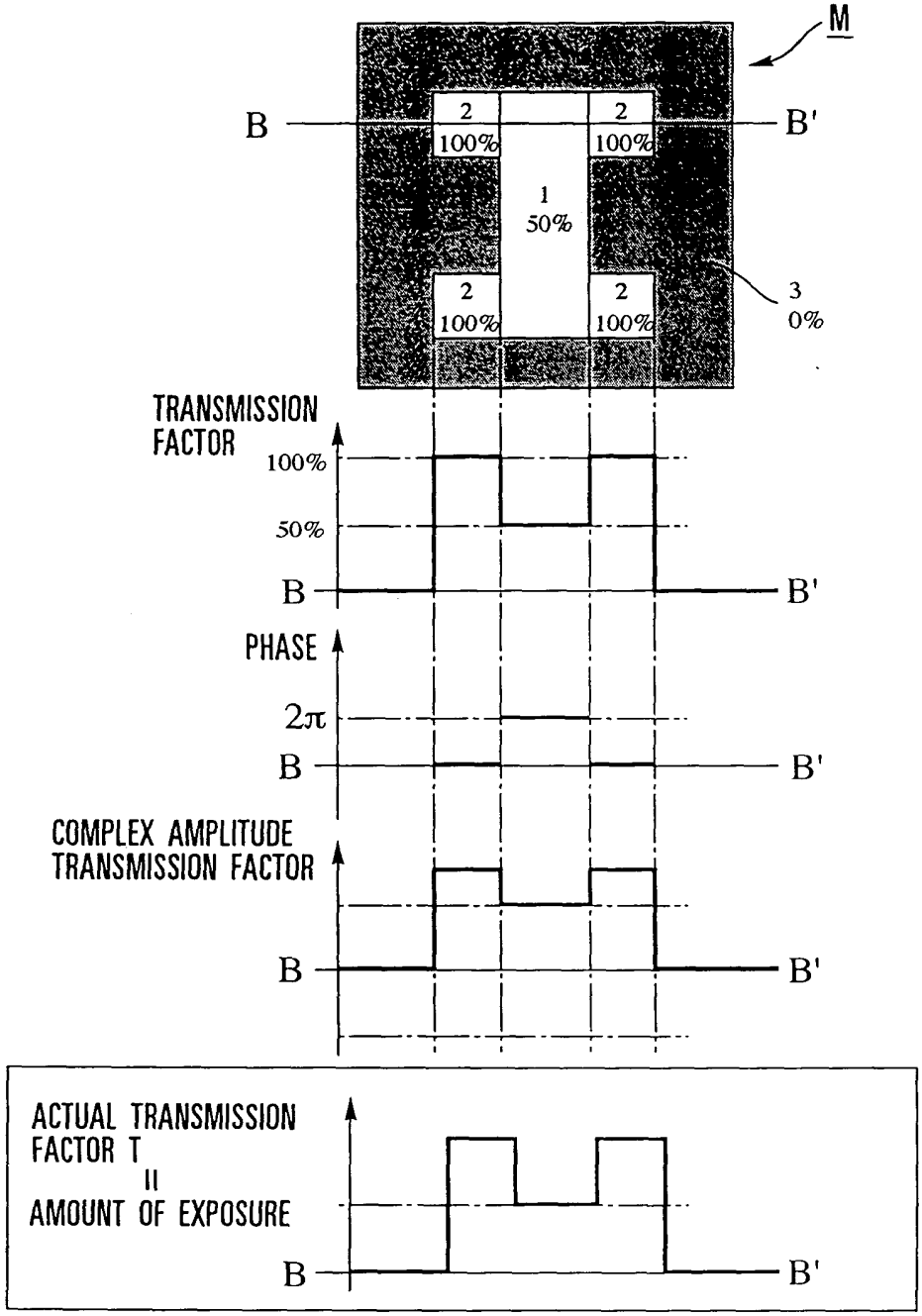
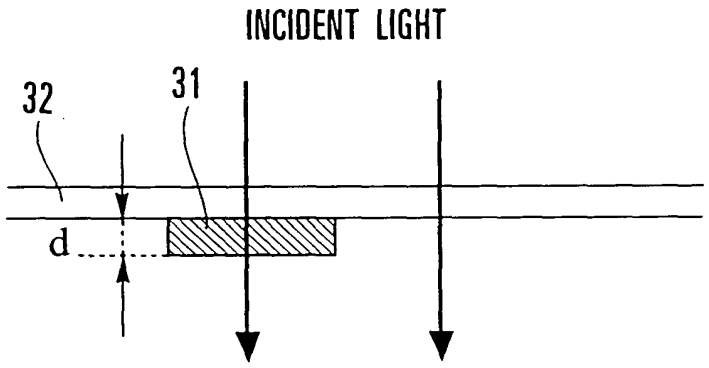

M
B
B'
2
100%
2
100%
1
50%
2
100%
2
100%
3
0%
TRANSMISSION FACTOR
100%
50%
B
B'
PHASE
2π
B
B'
COMPLEX AMPLITUDE TRANSMISSION FACTOR
B
B'
ACTUAL TRANSMISSION FACTOR T
II
AMOUNT OF EXPOSURE
B
B'

FIG. 9



$$\left\{ \begin{array}{ll} T = e^{-cd} & \leftarrow \text{TRANSMISSION FACTOR} \\ \theta = 2\pi \frac{nd}{\lambda} & \leftarrow \text{PHASE CHANGE} \end{array} \right\} \text{FORMULAS (1)}$$

$$d = \frac{(-\log T)}{c}$$

$$\theta = 2\pi \frac{n(-\log T)}{\lambda \quad c}$$

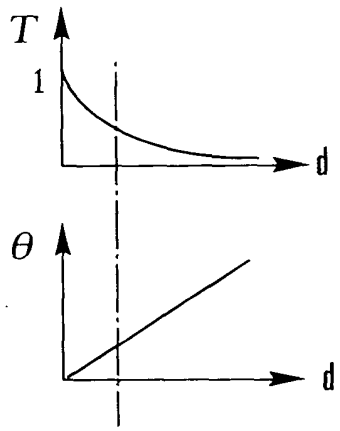
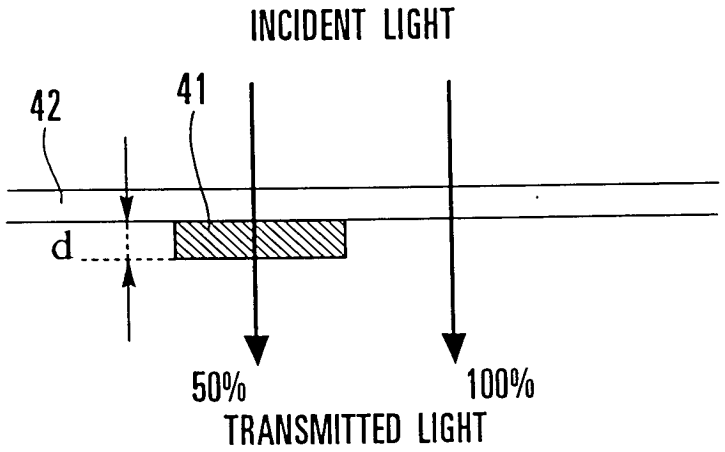


FIG. 10



$$\begin{cases} T = e^{-cd} & \leftarrow \text{TRANSMISSION FACTOR} \\ \theta = 2\pi\frac{nd}{\lambda} = 2m\pi & \leftarrow \text{PHASE CHANGE} \end{cases}$$

$$d = \frac{m\lambda}{n} = \frac{(-\log T)}{c}$$

$$\boxed{\frac{n}{c} = \frac{m\lambda}{(-\log T)}}$$

} FORMULAS (2)

FIG. 11

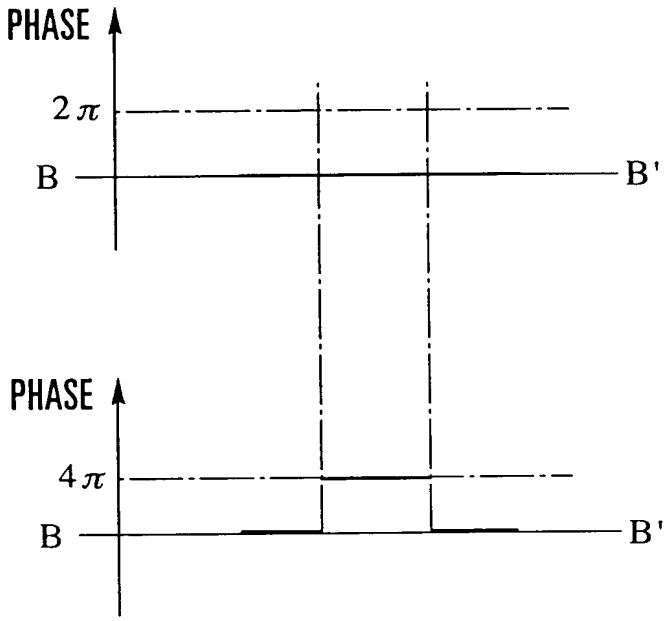


FIG. 12

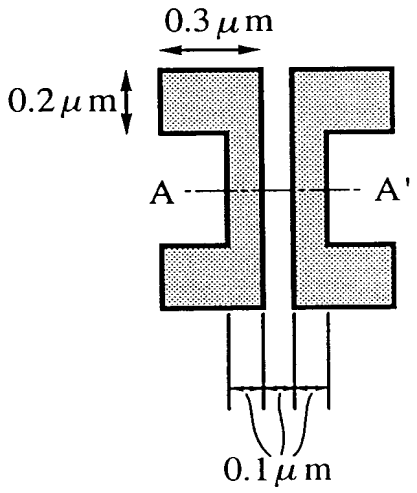
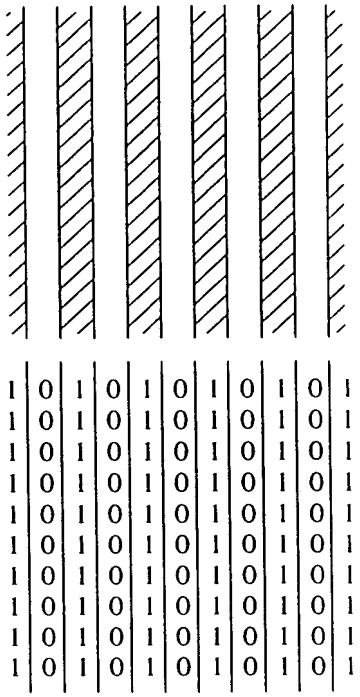
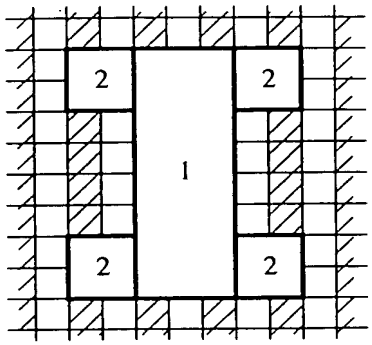


FIG. 13 (A)



1	0	1	0	1	0	1	0	1	0	1
1	0	1	0	1	0	1	0	1	0	1
1	0	1	0	1	0	1	0	1	0	1
1	0	1	0	1	0	1	0	1	0	1
1	0	1	0	1	0	1	0	1	0	1
1	0	1	0	1	0	1	0	1	0	1
1	0	1	0	1	0	1	0	1	0	1
1	0	1	0	1	0	1	0	1	0	1
1	0	1	0	1	0	1	0	1	0	1
1	0	1	0	1	0	1	0	1	0	1

FIG. 13 (B)



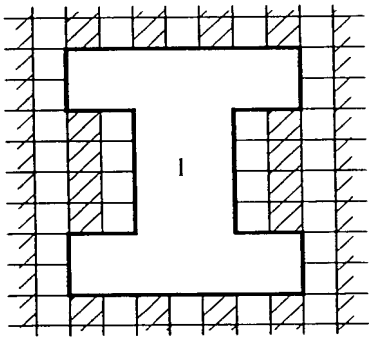
0	0	0	0	0	0	0	0	0	0	0
0	0	2	2	1	1	1	2	2	0	0
0	0	2	2	1	1	1	2	2	0	0
0	0	0	0	1	1	1	0	0	0	0
0	0	0	0	1	1	1	0	0	0	0
0	0	0	0	1	1	1	0	0	0	0
0	0	0	0	1	1	1	0	0	0	0
0	0	2	2	1	1	1	2	2	0	0
0	0	2	2	1	1	1	2	2	0	0
0	0	0	0	0	0	0	0	0	0	0

FIG. 13 (C)

1	0	1	0	1	0	1	0	1	0	1
1	0	3	2	2	1	2	2	3	0	1
1	0	3	2	2	1	2	2	3	0	1
1	0	1	0	2	1	2	0	1	0	1
1	0	1	0	2	1	2	0	1	0	1
1	0	1	0	2	1	2	0	1	0	1
1	0	1	0	2	1	2	0	1	0	1
1	0	3	2	2	1	2	2	3	0	1
1	0	3	2	2	1	2	2	3	0	1
1	0	1	0	1	0	1	0	1	0	1

1	0	1	0	1	0	1	0	1	0	1
1	0	3	2	2	1	2	2	3	0	1
1	0	3	2	2	1	2	2	3	0	1
1	0	1	0	2	1	2	0	1	0	1
1	0	1	0	2	1	2	0	1	0	1
1	0	1	0	2	1	2	0	1	0	1
1	0	1	0	2	1	2	0	1	0	1
1	0	3	2	2	1	2	2	3	0	1
1	0	3	2	2	1	2	2	3	0	1
1	0	1	0	1	0	1	0	1	0	1

FIG. 13 (D)



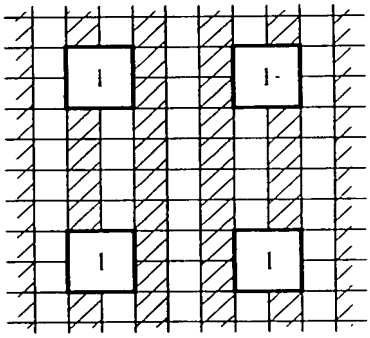
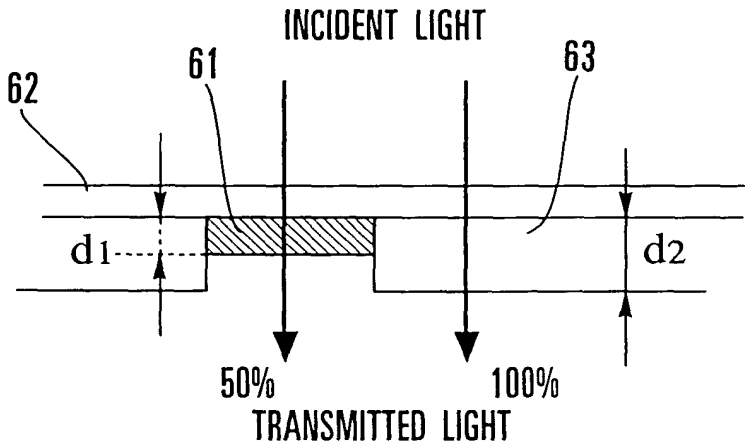


FIG. 14



$$\begin{cases} T = \dfrac{e^{-c_1 d_1}}{e^{-c_2 d_2}} & \leftarrow \text{TRANSMISSION FACTOR RATIO} \\ \theta = 2\pi \dfrac{n_1 d_1 - n_2 d_2}{\lambda} = 2m\pi & \leftarrow \text{PHASE CHANGE DIFFERENCE} \end{cases}$$

FORMULAS (3)

$c_2 = 0,\ m = 0$

$$d_1 = \frac{(-\log T)}{c_1}$$

$$d_2 = \frac{n_1}{n_2} d_1$$

FORMULAS (4)

FIG. 15

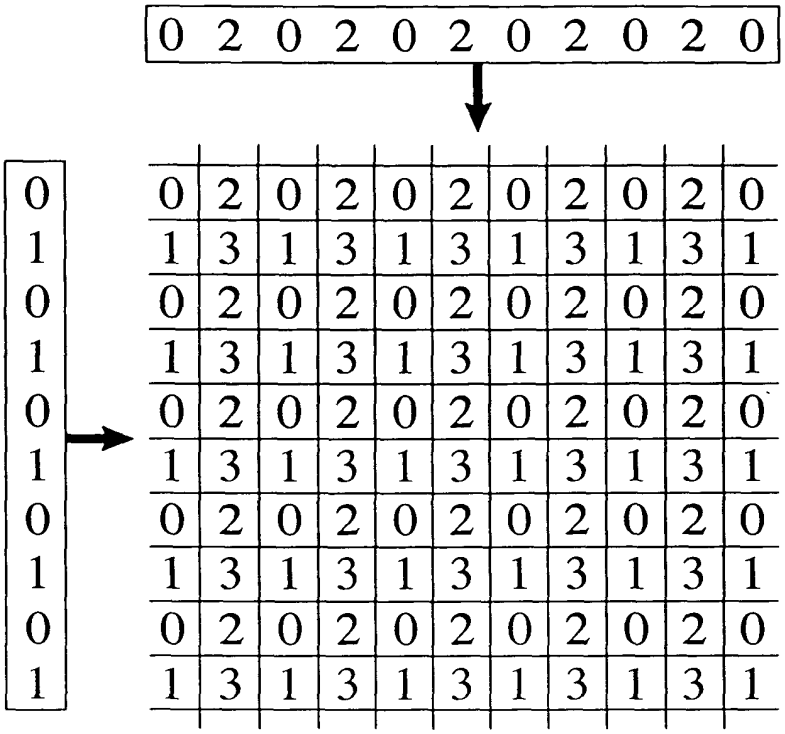

0 2 0 2 0 2 0 2 0 2 0
0 2 0 2 0 2 0 2 0 2 0
1 3 1 3 1 3 1 3 1 3 1
0 2 0 2 0 2 0 2 0 2 0
1 3 1 3 1 3 1 3 1 3 1
0 2 0 2 0 2 0 2 0 2 0
1 3 1 3 1 3 1 3 1 3 1
0 2 0 2 0 2 0 2 0 2 0
1 3 1 3 1 3 1 3 1 3 1
0 2 0 2 0 2 0 2 0 2 0
1 3 1 3 1 3 1 3 1 3 1
0
1
0
1
0
1
0
1
0
1

FIG. 16

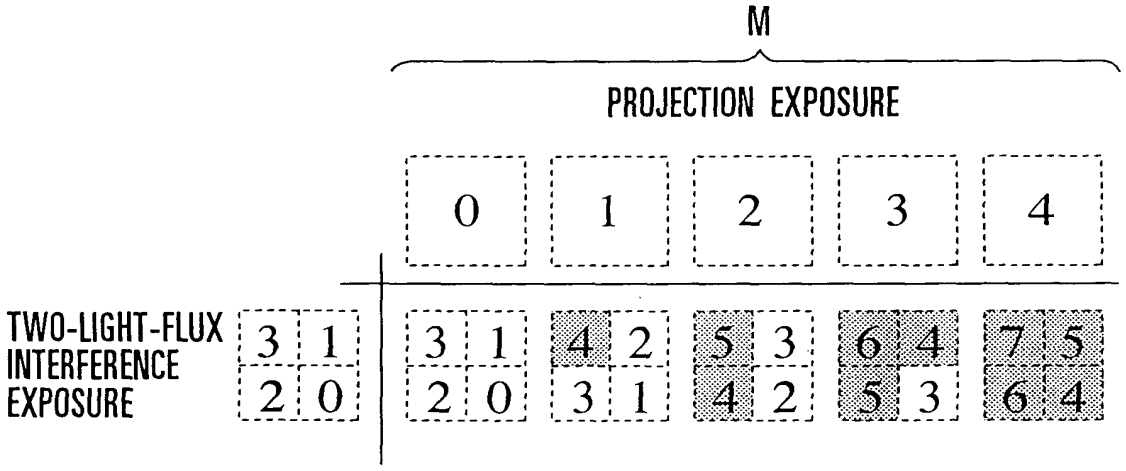

M
PROJECTION EXPOSURE
0
1
2
3
4
TWO-LIGHT-FLUX INTERFERENCE EXPOSURE
3 1
2 0
3 1
2 0
4 2
3 1
5 3
4 2
6 4
5 3
7 5
6 4

FIG. 17

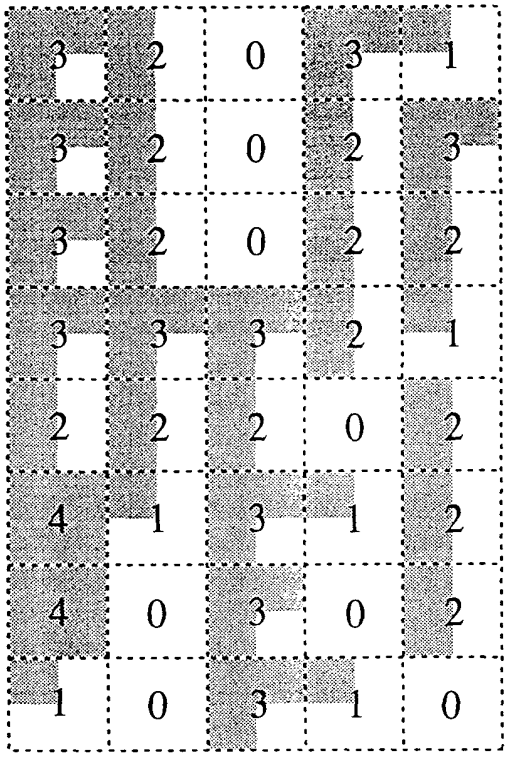
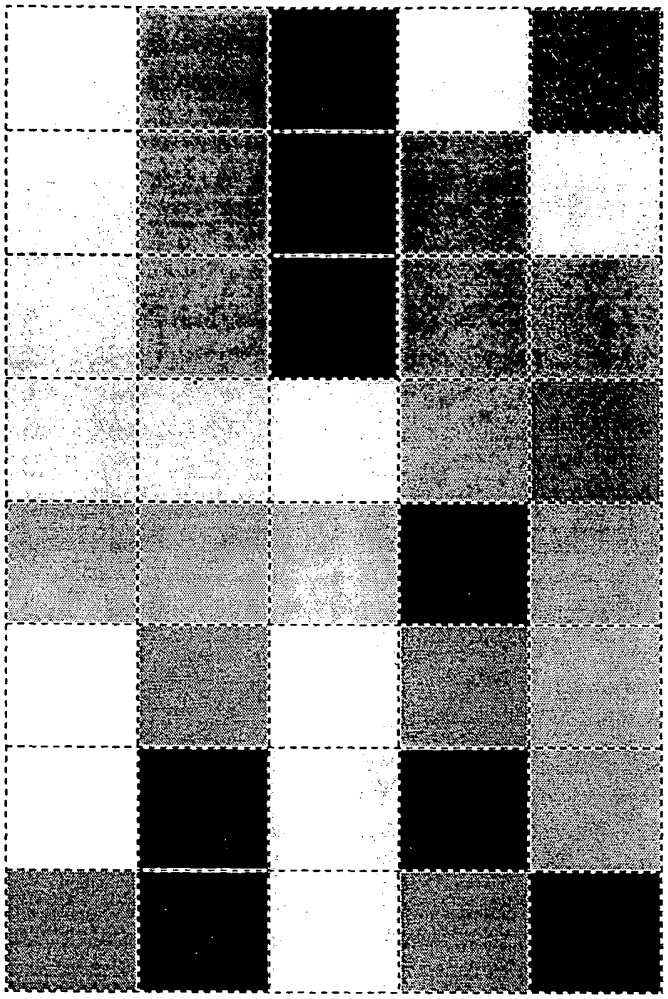
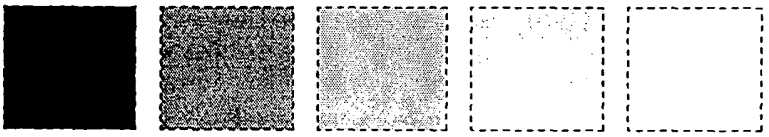


FIG. 18





AMOUNT OF EXPOSURE	0	1	2	3	4
TRANSMISSION FACTOR	0 %	25 %	50 %	75 %	100 %
PHASE CHANGE	--	6 π	4 π	2 π	0

FIG. 19

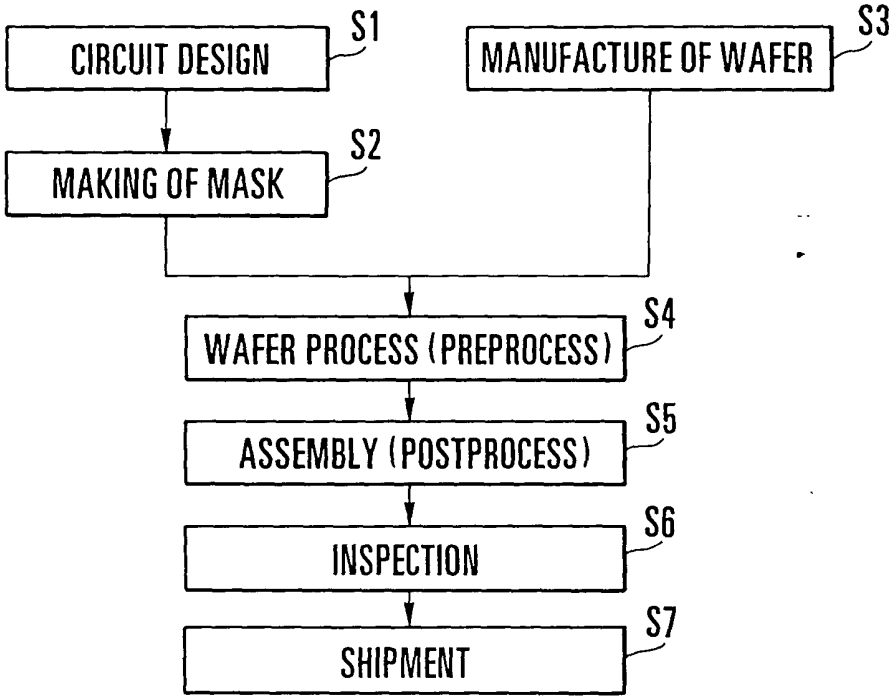

CIRCUIT DESIGN
S1
MANUFACTURE OF WAFER
S3
MAKING OF MASK
S2
WAFER PROCESS (PREPROCESS)
S4
ASSEMBLY (POSTPROCESS)
S5
INSPECTION
S6
SHIPMENT
S7

FIG. 20

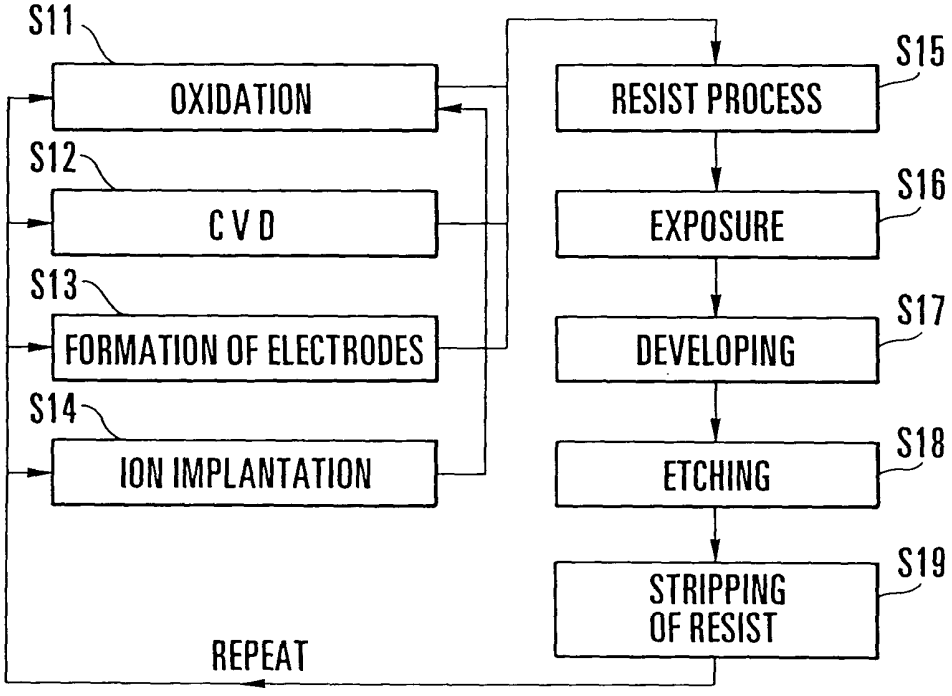

S11
OXIDATION
S12
CVD
S13
FORMATION OF ELECTRODES
S14
ION IMPLANTATION
S15
RESIST PROCESS
S16
EXPOSURE
S17
DEVELOPING
S18
ETCHING
S19
STRIPPING OF RESIST
REPEAT

FIG. 21

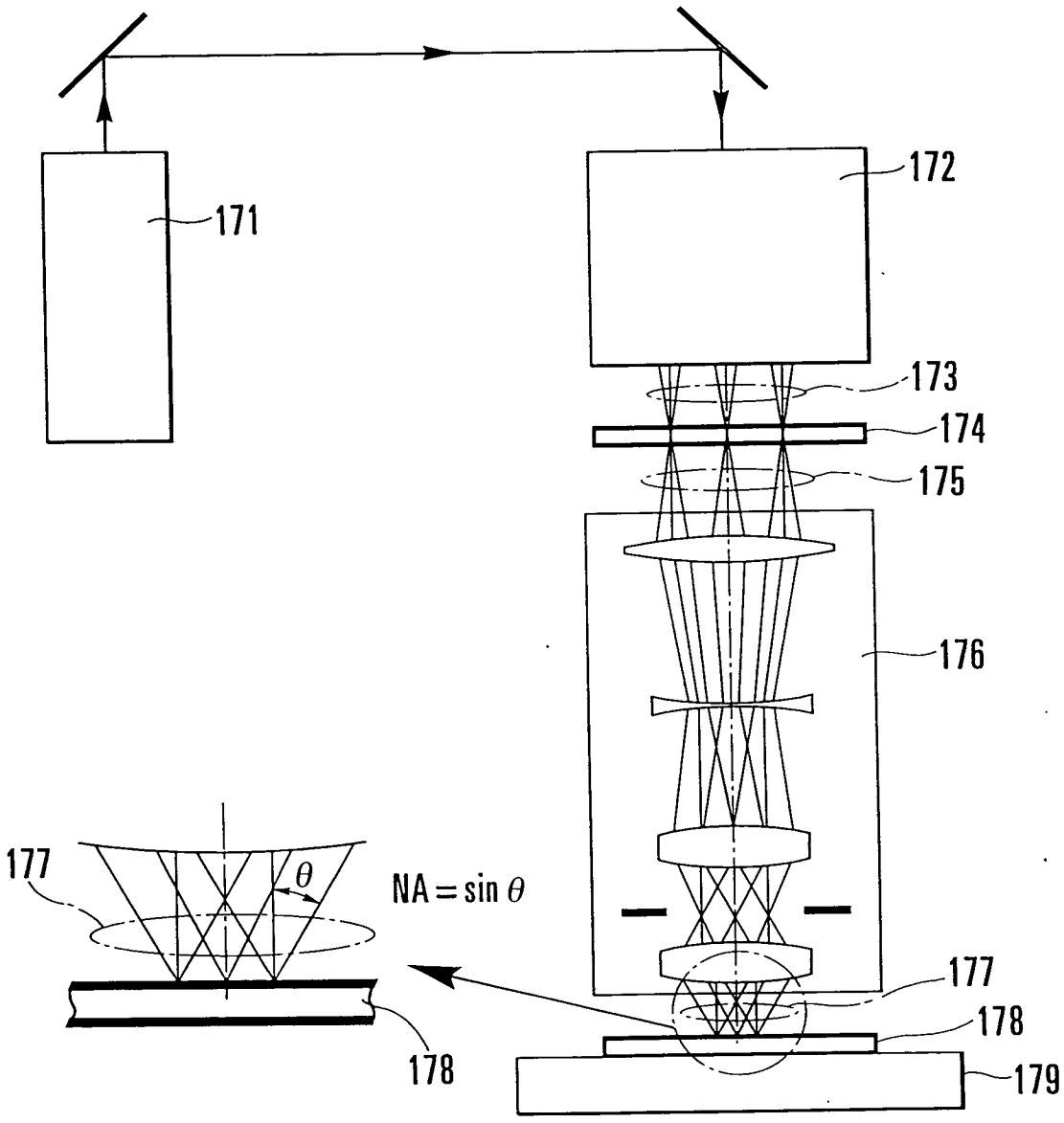


FIG. 22

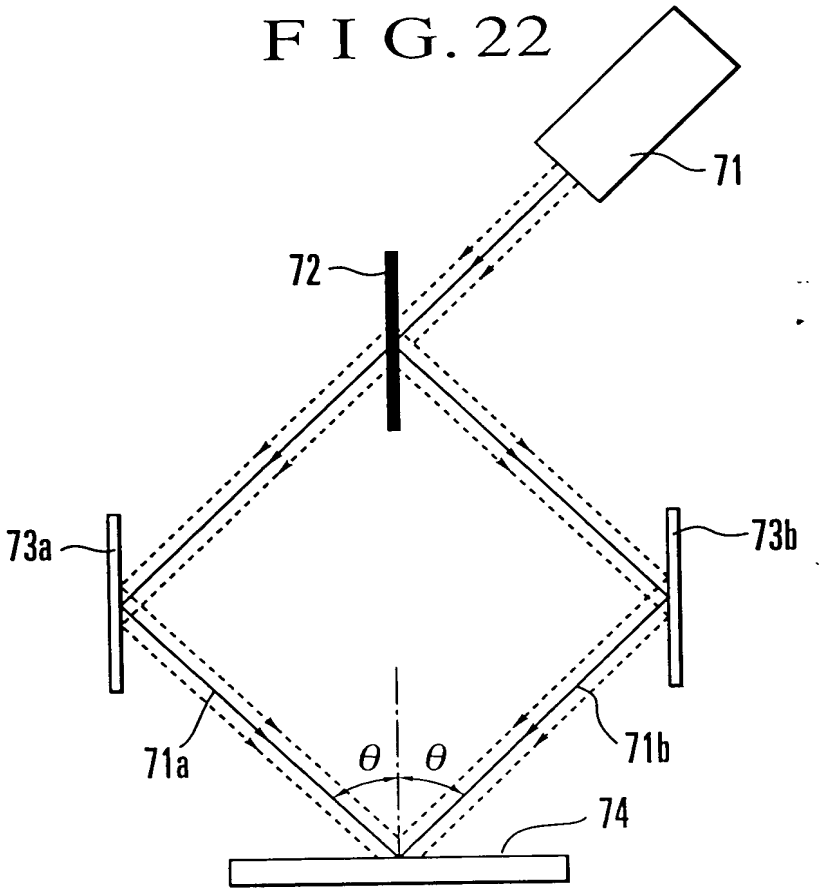


FIG. 23

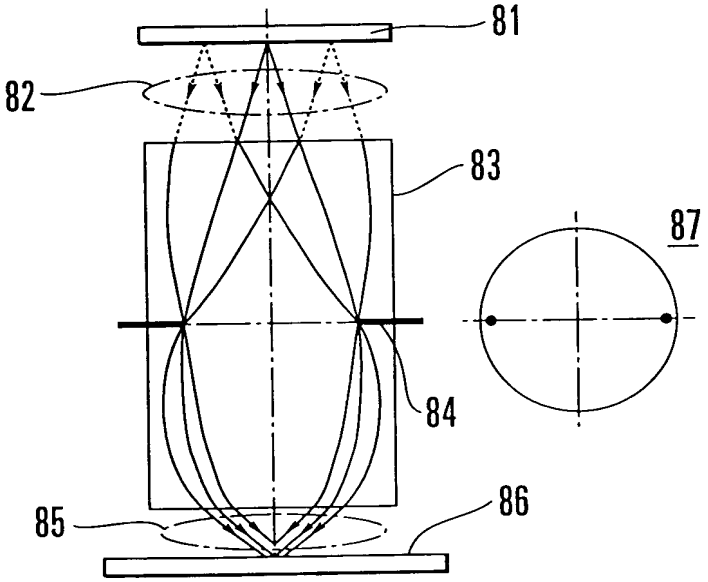


FIG. 24(A)

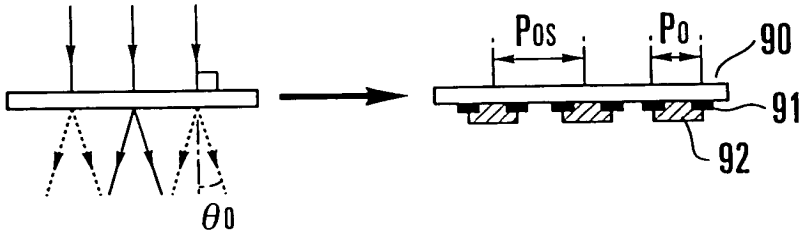


FIG. 24(B)

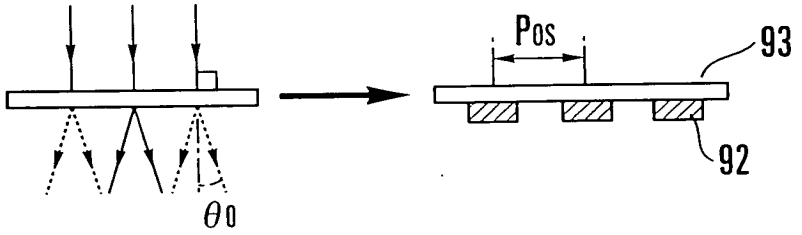


FIG. 25

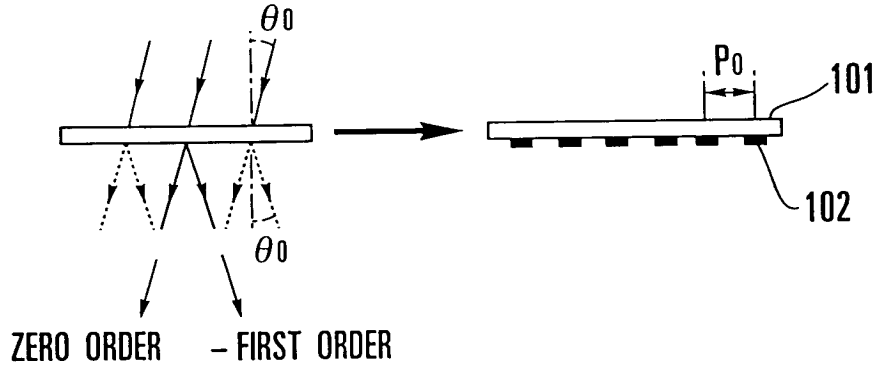
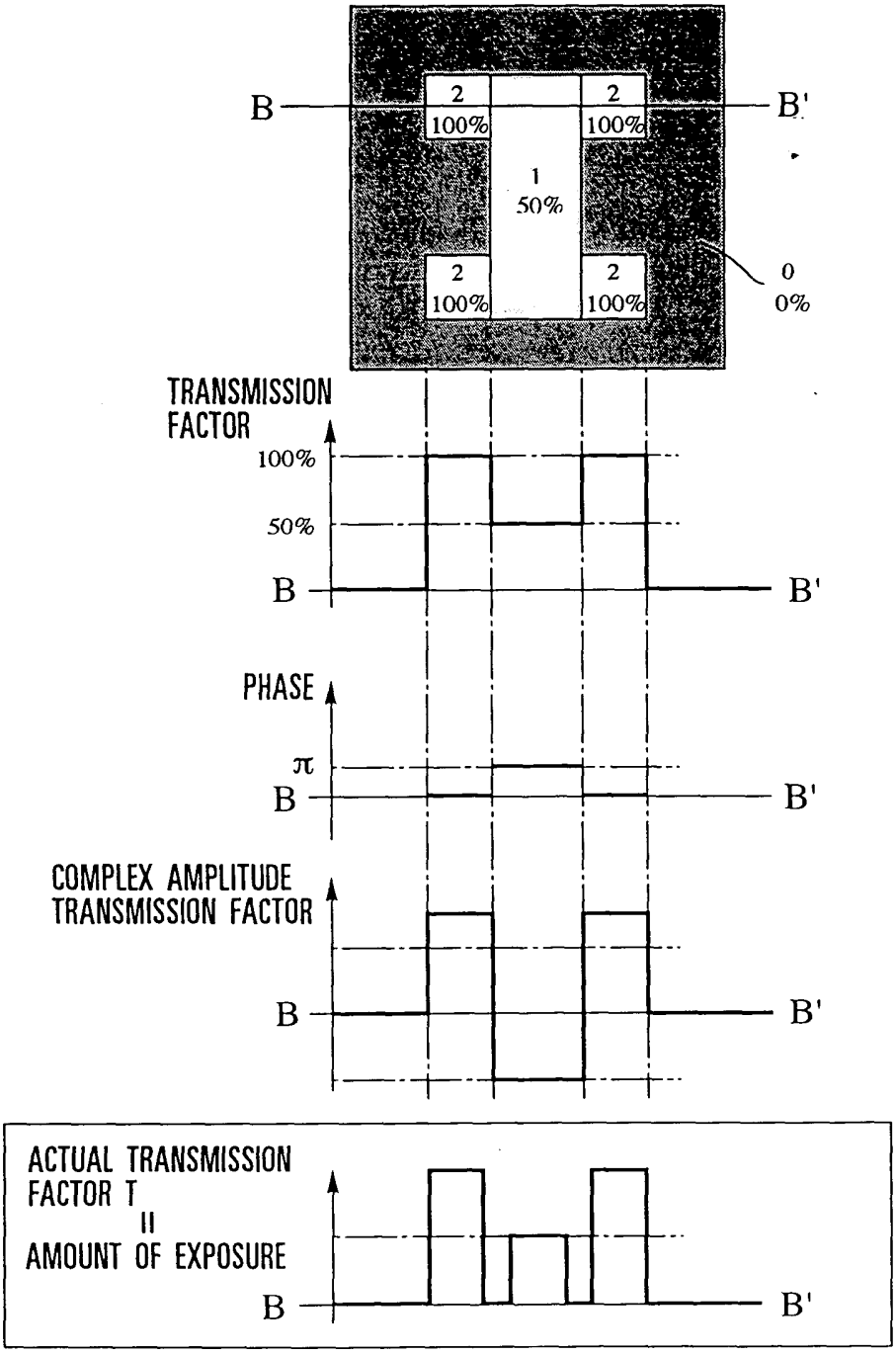


FIG. 26


B
B'
2
100%
2
100%
1
50%
2
100%
2
100%
0
0%
TRANSMISSION FACTOR
100%
50%
B
B'
PHASE
π
B
B'
COMPLEX AMPLITUDE TRANSMISSION FACTOR
B
B'
ACTUAL TRANSMISSION FACTOR T
II
AMOUNT OF EXPOSURE
B
B'